IOT-BASED AIR QUALITY INDEX METER

BY

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INTRODUCTION

- In an era, the integration of IOT environmental monitoring systems, particularly Air quality Index(AQI) systems, is crucial for public health and environmental protection.
- IOT technology connects sensors to measure air pollutants like PM2.5, PM10, CO and NO_2.
- Data is transferred to a central server for analysis and accessibility.
- It also plays a crucial role in shaping policies and raising awareness.
- This real-time monitoring helps mitigate poor air quality impacts, shapes policies and raise awareness about maintaining a healthy environment.
- IOT based AQI systems enable continuous monitoring of air pollutants, providing timely insights and prompt responses to deteriorating air conditions.

PROBLEM STATEMENT

- The primary issue with this project is its lengthy detection range, which prevents it from accurately displaying the city's air quality reading on the sensors.
- The project aims to identify key pollutants, analyze their impact on health and the environment and develop a robust system for continuous monitoring.
- The solution’s business scope includes urban planning, public health management and industrial compliance with primary end-users being environmental agencies, local governments, industries and the public.
- Urbanization and industrialization have led to a decline in air quality, posing health risks and environmental issues. A project aims to develop an IOT-based AQI system to monitor air pollutants in real-time enabling timely interventions and informed decision-making.

LITERATURE REVIEW/BACKGROUND

STUDY	AUTHORS	YEAR	KEY FINDINGS
Deployment of Low-Cost Sensors	Kumar et al.	2019	The study showcased the efficacy of low-cost, IoT-based sensors in monitoring scalable air quality.
Predictive Analytics in AQI Systems	Smith and Lee	2020	The integration of machine learning for predictive analytics has been highlighted as a method to improve early warning systems.
Real-Time Data for Public Health	Johnson et al.	2021	The use of real-time, IoT-based air quality data has significantly enhanced public health responses.
Enhancing Environmental Awareness	Chen and Patel	2022	The article highlighted the significant role of IoT in enhancing public engagement and raising awareness about air quality issues.

PROPOSED DESIGN/METHOGOLDY

- **ABSTRACT DESIGN**
- The IoT-based Air Quality Index Meter uses advanced sensors to monitor air quality in real-time, transmitting data via wireless to a cloud-based platform for accurate, reliable, and user-centric monitoring.
- **COMPONENT LEVEL DESGIN**
- The project involves designing sensor modules, microcontrollers, and communication interfaces for data acquisition, processing, transmission, and seamless transfer between sensor nodes and cloud platforms.
- **SRS**
- The SRS document will outline the functional and non-functional requirements of an air quality index meter, ensuring accurate pollutant measurement, real-time data transmission, user alerts, and performance metrics.

PROPOSED DESIGN/METHOGOLDY

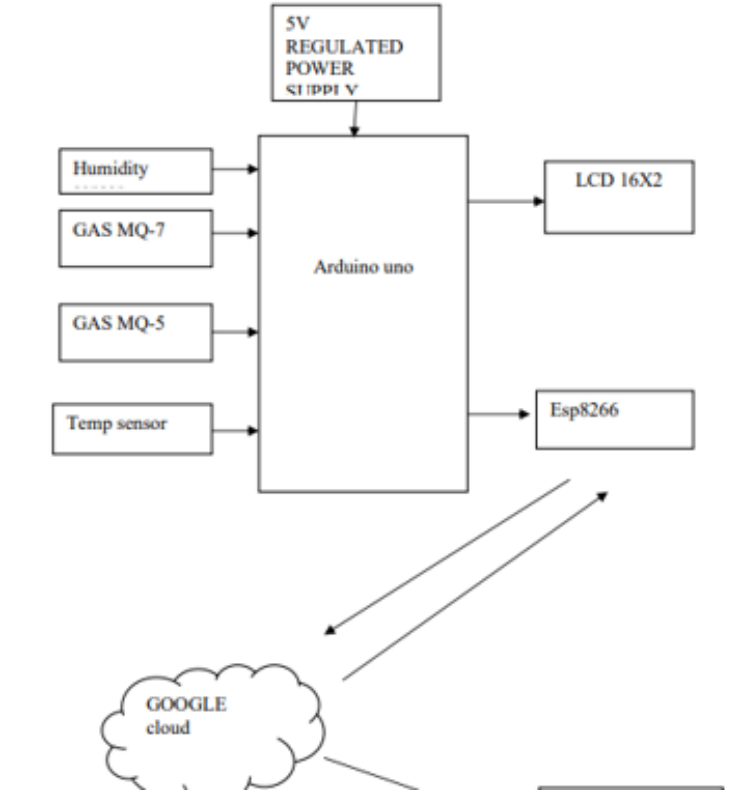
- $$\boldsymbol{AQI} = \left[\frac{(\boldsymbol{PMobs}-\boldsymbol{PMmin})*(\boldsymbol{AQImax}-\boldsymbol{AQImin})}{(\boldsymbol{PMmax}-\boldsymbol{PMmin})}\right] +$$

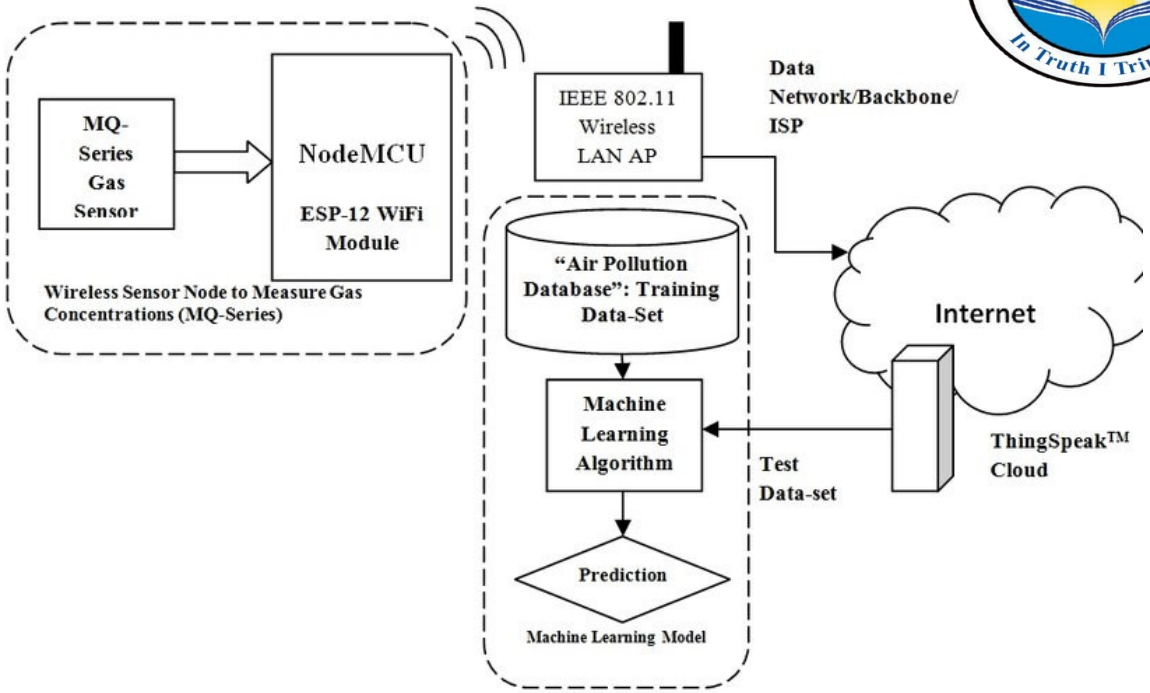
AQImin

->4.1

- $\text{AQI}=\left(\frac{\text{Ci}-\text{Clow}}{Chigh-Clow}\right) * (Ihigh - Ilow) + Ilow$-

>4.2





PROPOSED DESIGN/METHOGOLDY

- FIGURE 1:BLOCK DIAGRAM OF IOT BASED AQI METER
- FIGURE 2:PROJECT DIAGRM OF IOT BASED AQI METER

HARDWARE TOOLS

1:ESP32/ESP8266

2:ARDUINO

3:MQ SERIES GAS SENSOR(MQ-135 OR MQ-5)

4:PM2.5 AND PM10 SENSORS

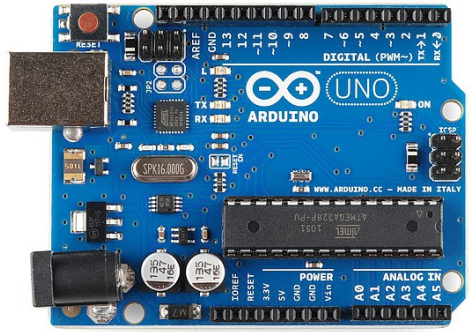
5: BATTERY PACK

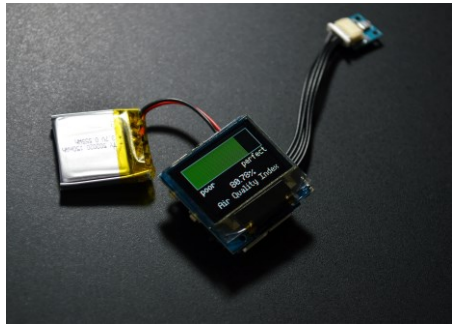
6: POWER ADAPTER

7: CHARGER SETUP

8: WEATHERPROOF HOUSING

9: WiFi/BLUETOOTH MODULES





SOFTWARE TOOLS

1: ANDORID STUDIO

2: FIREBASE

3:BLYNK APP

4:MATLAB

5:PYTHON

6: ARDUINO FRAMEWORK

7:VS CODE FOR FIRMWARE CODING

8: THINGS SPEAK

9:MQTT PROTOCOLS

10: AWS IOT

11:ADAFRUIT IO

12:GITHUB

13: AUTHENTICATION MECHANISMS

14: GAFRANA

15:EXCEL

16:HTTP/HTTPS

17:SENSOR AND WiFi LIBRARIES

PROPOSED WORK PLAN

- 1. Identify Project Modules/Features/Tasks/Activities
- MODULE 1: Requirement Analysis and Research
- MODULE 2: System Design
- MODULE 3: Hardware Assembly and Testing
- MODULE 4: Software Development
- MODULE 5: System Integration and Testing
- MODULE 6: Deployment and Documentation
- 2. Time Needed to Implement Each Module/Feature/Task/Activity
- Module 1: Requirement Analysis and Research - 2 weeks
- Module 2: System Design - 3 weeks
- Module 3: Hardware Assembly and Testing - 4 weeks

PROPOSED WORK PLAN(CONTINUED

- Module 4: Software Development - 6 weeks
- Module 5: System Integration and Testing - 4 weeks
- Module 6: Deployment and Documentation - 3 weeks
- **Semester-wise Workload Plan:**
- **Semester 7:**
- Focus on Modules 1, 2, and part of Module 3.
- **Semester 8:**
- Focus on completing Module 3 and Modules 4, 5, and 6.
- **4. Gantt Chart for IoT-Based AQI Meter Project**

CONCLUSION

- In conclusion, the IoT-based Air Quality Index (AQI) Meter is a cost-effective solution for real-time monitoring of air quality.
- It collects, analyzes, and displays data, providing insights for proactive pollution mitigation and public health protection.
- The system integrates sensors, cloud connectivity, and data visualization tools, ensuring accurate readings and informed decision-making.
- This project could significantly contribute to environmental monitoring and improve quality of life by addressing air pollution challenges.

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